

# SEQUENCE LISTING

<110> Covacci, Antonio  
Bugnoli, Massimo  
Telford, John  
Macchia, Giovanni  
Rappuoli, Rino

<120> Helicobacter Pylori Cytotoxin Proteins Useful For  
Vaccines And Diagnostics

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<150> 08/256,848

<151> 1994-10-21

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<150> PCT/EP93/00158

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<170> PatentIn Ver. 2.1

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Lys Glu Ala Ile Asn Gln Glu Pro Val Pro His Val Gln Pro Asp Ile		
225	230	235
Ala Thr Thr Thr Thr Asp Ile Gln Gly Leu Pro Pro Glu Ala Arg Asp		
245	250	255
Leu Leu Asp Glu Arg Gly Asn Phe Ser Lys Phe Thr Leu Gly Asp Met		
260	265	270
Glu Met Leu Asp Val Glu Gly Val Ala Asp Ile Asp Pro Asn Tyr Lys		
275	280	285
Phe Asn Gln Leu Leu Ile His Asn Asn Ala Leu Ser Ser Val Leu Met		
290	295	300
Gly Ser His Asn Gly Ile Glu Pro Glu Lys Val Ser Leu Leu Tyr Gly		
305	310	315
Gly Asn Gly Gly Pro Gly Ala Arg His Asp Trp Asn Ala Thr Val Gly		
325	330	335
Tyr Lys Asp Gln Gln Gly Asn Asn Val Ala Thr Ile Ile Asn Val His		
340	345	350
Met Lys Asn Gly Ser Gly Leu Val Ile Ala Gly Gly Glu Lys Gly Ile		
355	360	365
Asn Asn Pro Ser Phe Tyr Leu Tyr Lys Glu Asp Gln Leu Thr Gly Ser		
370	375	380
Gln Arg Ala Leu Ser Gln Glu Glu Ile Gln Asn Lys Ile Asp Phe Met		
385	390	395
Glu Phe Leu Ala Gln Asn Asn Ala Lys Leu Asp Asn Leu Ser Glu Lys		
405	410	415
Glu Lys Glu Lys Phe Arg Thr Glu Ile Lys Asp Phe Gln Lys Asp Ser		
420	425	430
Lys Ala Tyr Leu Asp Ala Leu Gly Asn Asp Arg Ile Ala Phe Val Ser		

435		440		445
Lys Lys Asp Thr Lys His Ser Ala Leu Ile Thr Glu Phe Gly Asn Gly				
450		455		460
Asp Leu Ser Tyr Thr Leu Lys Asp Tyr Gly Lys Lys Ala Asp Lys Ala				
465		470		475
				480
Leu Asp Arg Glu Lys Asn Val Thr Leu Gln Gly Ser Leu Lys His Asp				
	485		490	495
Gly Val Met Phe Val Asp Tyr Ser Asn Phe Lys Tyr Thr Asn Ala Ser				
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Lys Asn Pro Asn Lys Gly Val Gly Val Thr Asn Gly Val Ser His Leu				
	515		520	525
Glu Val Gly Phe Asn Lys Val Ala Ile Phe Asn Leu Pro Asp Leu Asn				
	530		535	540
Asn Leu Ala Ile Thr Ser Phe Val Arg Arg Asn Leu Glu Asp Lys Leu				
545		550		555
				560
Thr Thr Lys Gly Leu Ser Pro Gln Glu Ala Asn Lys Leu Ile Lys Asp				
	565		570	575
Phe Leu Ser Ser Asn Lys Glu Leu Val Gly Lys Thr Leu Asn Phe Asn				
	580		585	590
Lys Ala Val Ala Asp Ala Lys Asn Thr Gly Asn Tyr Asp Glu Val Lys				
	595		600	605
Lys Ala Gln Lys Asp Leu Glu Lys Ser Leu Arg Lys Arg Glu His Leu				
	610		615	620
Glu Lys Glu Val Glu Lys Lys Leu Glu Ser Lys Ser Gly Asn Lys Asn				
625		630		635
				640
Lys Met Glu Ala Lys Ala Gln Ala Asn Ser Gln Lys Asp Glu Ile Phe				
	645		650	655
Ala Leu Ile Asn Lys Glu Ala Asn Arg Asp Ala Arg Ala Ile Ala Tyr				
	660		665	670
Ala Gln Asn Leu Lys Gly Ile Lys Arg Glu Leu Ser Asp Lys Leu Glu				
	675		680	685
Asn Val Asn Lys Asn Leu Lys Asp Phe Asp Lys Ser Phe Asp Glu Phe				

690		695		700
Lys Asn Gly Lys Asn Lys Asp Phe Ser Lys Ala Glu Glu Thr Leu Lys				
705		710		715 720
Ala Leu Lys Gly Ser Val Lys Asp Leu Gly Ile Asn Pro Glu Trp Ile				
	725		730	735
Ser Lys Val Glu Asn Leu Asn Ala Ala Leu Asn Glu Phe Lys Asn Gly				
	740		745	750
Lys Asn Lys Asp Phe Ser Lys Val Thr Gln Ala Lys Ser Asp Leu Glu				
	755		760	765
Asn Ser Val Lys Asp Val Ile Ile Asn Gln Lys Val Thr Asp Lys Val				
	770		775	780
Asp Asn Leu Asn Gln Ala Val Ser Val Ala Lys Ala Thr Gly Asp Phe				
	785		790	795 800
Ser Arg Val Glu Gln Ala Leu Ala Asp Leu Lys Asn Phe Ser Lys Glu				
	805		810	815
Gln Leu Ala Gln Gln Ala Gln Lys Asn Glu Ser Leu Asn Ala Arg Lys				
	820		825	830
Lys Ser Glu Ile Tyr Gln Ser Val Lys Asn Gly Val Asn Gly Thr Leu				
	835		840	845
Val Gly Asn Gly Leu Ser Gln Ala Glu Ala Thr Thr Leu Ser Lys Asn				
	850		855	860
Phe Ser Asp Ile Lys Lys Glu Leu Asn Ala Lys Leu Gly Asn Phe Asn				
	865		870	875 880
Asn Asn Asn Asn Asn Gly Leu Lys Asn Glu Pro Ile Tyr Ala Lys Val				
	885		890	895
Asn Lys Lys Lys Ala Gly Gln Ala Ala Ser Leu Glu Glu Pro Ile Tyr				
	900		905	910
Ala Gln Val Ala Lys Lys Val Asn Ala Lys Ile Asp Arg Leu Asn Gln				
	915		920	925
Ile Ala Ser Gly Leu Gly Val Val Gly Gln Ala Ala Gly Phe Pro Leu				
	930		935	940
Lys Arg His Asp Lys Val Asp Asp Leu Ser Lys Val Gly Leu Ser Arg				

945		950		955		960
Asn Gln Glu Leu Ala Gln Lys Ile Asp Asn Leu Asn Gln Ala Val Ser						
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Glu Ala Lys Ala Gly Phe Phe Gly Asn Leu Glu Gln Thr Ile Asp Lys						
	980			985		990
Leu Lys Asp Ser Thr Lys His Asn Pro Met Asn Leu Trp Val Glu Ser						
	995		1000			1005
Ala Lys Lys Val Pro Ala Ser Leu Ser Ala Lys Leu Asp Asn Tyr Ala						
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Thr Asn Ser His Ile Arg Ile Asn Ser Asn Ile Lys Asn Gly Ala Ile						
1025		1030		1035		1040
Asn Glu Lys Ala Thr Gly Met Leu Thr Gln Lys Asn Pro Glu Trp Leu						
	1045			1050		1055
Lys Leu Val Asn Asp Lys Ile Val Ala His Asn Val Gly Ser Val Pro						
	1060		1065			1070
Leu Ser Glu Tyr Asp Lys Ile Gly Phe Asn Gln Lys Asn Met Lys Asp						
	1075		1080			1085
Tyr Ser Asp Ser Phe Lys Phe Ser Thr Lys Leu Asn Asn Ala Val Lys						
	1090		1095			1100
Asp Thr Asn Ser Gly Phe Thr Gln Phe Leu Thr Asn Ala Phe Ser Thr						
1105		1110		1115		1120
Ala Ser Tyr Tyr Cys Leu Ala Arg Glu Asn Ala Glu His Gly Ile Lys						
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Asn Val Asn Thr Lys Gly Gly Phe Gln Lys Ser						
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Arg	Gly	Arg	Asn	Val	Leu	Ile	Gln	Lys	Ser	Tyr	Gly	Ala	Pro	Ser	Ile	35	40	45	
Thr	Lys	Asp	Gly	Val	Ser	Val	Ala	Lys	Glu	Ile	Glu	Leu	Ser	Cys	Pro	50	55	60	
Val	Ala	Asn	Met	Gly	Ala	Gln	Leu	Val	Lys	Glu	Val	Ala	Ser	Lys	Thr	65	70	75	80
Ala	Asp	Ala	Ala	Gly	Asp	Gly	Thr	Thr	Thr	Ala	Thr	Val	Leu	Ala	Tyr	85	90	95	
Ser	Ile	Phe	Lys	Glu	Gly	Leu	Arg	Asn	Ile	Thr	Ala	Gly	Ala	Asn	Pro	100	105	110	
Ile	Glu	Val	Lys	Arg	Gly	Met	Asp	Lys	Ala	Ala	Glu	Ala	Ile	Ile	Asn	115	120	125	
Glu	Leu	Lys	Lys	Ala	Ser	Lys	Lys	Val	Gly	Gly	Lys	Glu	Glu	Ile	Thr	130	135	140	
Gln	Val	Ala	Thr	Ile	Ser	Ala	Asn	Ser	Asp	His	Asn	Ile	Gly	Lys	Leu	145	150	155	160
Ile	Ala	Asp	Ala	Met	Glu	Lys	Val	Gly	Lys	Asp	Gly	Val	Ile	Thr	Val	165	170	175	
Glu	Glu	Ala	Lys	Gly	Ile	Glu	Asp	Glu	Leu	Asp	Val	Val	Glu	Gly	Met	180	185	190	
Gln	Phe	Asp	Arg	Gly	Tyr	Leu	Ser	Pro	Tyr	Phe	Val	Thr	Asn	Ala	Glu	195	200	205	
Lys	Met	Thr	Ala	Gln	Leu	Asp	Asn	Ala	Tyr	Ile	Leu	Leu	Thr	Asp	Lys	210	215	220	
Lys	Ile	Ser	Ser	Met	Lys	Asp	Ile	Leu	Pro	Leu	Leu	Glu	Lys	Thr	Met	225	230	235	240
Lys	Glu	Gly	Lys	Pro	Leu	Leu	Ile	Ile	Ala	Glu	Asp	Ile	Glu	Gly	Glu	245	250	255	
Ala	Leu	Thr	Thr	Leu	Val	Val	Asn	Lys	Leu	Arg	Gly	Val	Leu	Asn	Ile	260	265	270	



Ala	Ala	Val	Lys	Ala	Pro	Gly	Phe	Gly	Asp	Arg	Arg	Lys	Glu	Met	Leu	275	280	285
Lys	Asp	Ile	Ala	Ile	Leu	Thr	Gly	Gly	Gln	Val	Ile	Ser	Glu	Glu	Leu	290	295	300
Gly	Leu	Ser	Leu	Glu	Asn	Ala	Glu	Val	Glu	Phe	Leu	Gly	Lys	Ala	Gly	305	310	315
Arg	Ile	Val	Ile	Asp	Lys	Asp	Asn	Thr	Thr	Ile	Val	Asp	Gly	Lys	Gly	325	330	335
His	Ser	Asp	Asp	Val	Lys	Asp	Arg	Val	Ala	Gln	Ile	Lys	Thr	Gln	Ile	340	345	350
Ala	Ser	Thr	Thr	Ser	Asp	Tyr	Asp	Lys	Glu	Lys	Leu	Gln	Glu	Arg	Leu	355	360	365
Ala	Lys	Leu	Ser	Gly	Gly	Val	Ala	Val	Ile	Lys	Val	Gly	Ala	Ala	Ser	370	375	380
Glu	Val	Glu	Met	Lys	Glu	Lys	Lys	Asp	Arg	Val	Asp	Asp	Ala	Leu	Ser	385	390	395
Ala	Thr	Lys	Ala	Ala	Val	Glu	Glu	Gly	Ile	Val	Ile	Gly	Gly	Gly	Ala	405	410	415
Ala	Leu	Ile	Arg	Ala	Ala	Gln	Lys	Val	His	Leu	Asn	Leu	His	Asp	Asp	420	425	430
Glu	Lys	Val	Gly	Tyr	Glu	Ile	Ile	Met	Arg	Ala	Ile	Lys	Ala	Pro	Leu	435	440	445
Ala	Gln	Ile	Ala	Ile	Asn	Ala	Gly	Tyr	Asp	Gly	Gly	Val	Val	Val	Asn	450	455	460
Glu	Val	Glu	Lys	His	Glu	Gly	His	Phe	Gly	Phe	Asn	Ala	Ser	Asn	Gly	465	470	475
Lys	Tyr	Val	Asp	Met	Phe	Lys	Glu	Gly	Ile	Ile	Asp	Pro	Leu	Lys	Val	485	490	495
Glu	Arg	Ile	Ala	Leu	Gln	Asn	Ala	Val	Ser	Val	Ser	Ser	Leu	Leu	Leu	500	505	510
Thr	Thr	Glu	Ala	Thr	Val	His	Glu	Ile	Lys	Glu	Glu	Lys	Ala	Thr	Pro	515	520	525

Ala Met Pro Asp Met Gly Gly Met Gly Gly Met Gly Gly Met Gly Gly  
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 545

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**07-08-2019**

**07-29-2006**

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